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Evaluation of the Introduction of New Technologies as a Support to Learning

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Abstract

This study analyses the replies given by a group of undergraduates studying Medical Technology at the University of Talca on a questionnaire examining their **degree of satisfaction concerning the introduction of new technologies as a support to their learning.** The support system used was My WebCT learning platform applied to the teaching of the subject of Clinical Biochemistry. The team of teachers prepared class and laboratory materials which were posted to the platform in an ordered and sequenced manner.

The questionnaire examined five groups of variable: quality, quantity, accessibility, impact and user satisfaction. The results obtained were: Quality – the students responded positively; Quantity – the students reported encountering certain difficulties; Accessibility - good; Satisfaction – a high degree of satisfaction was expressed regarding the introduction of this new technology; Impact – an improvement was noted in levels of motivation and a better organization in the students' study patterns.

Key words

Teaching innovation, ICTs, teaching assessment, user satisfaction.

1. Introduction

The introduction of technologies in the teaching and learning process dates back many years. Since the earliest "teaching machines" developed back in the twenties up to the current

multimedia and hypertext systems, which allow a much richer and autonomous interaction for the student, the subject of technologies has been one of the central concerns of debate, thinking and research in education. From a purely pedagogic perspective, specific attention in the field of learning technologies has been given to: curriculum organization, development processes, and evaluation. Similarly, psychological and epistemological research has experienced great progress in this field.

Today, Information and Communication Technologies (ICTs) constitute a major part of education programs in developed countries. ICTs lie at the heart of all national policies in this field. All the European countries include the development and integration of such platforms within their official texts, be it in primary or secondary education, where their application figures as a compulsory subject in virtually all these nations. The aims of learning "cover a wide range of skills from the use of computers to communication on the net, including information search techniques in CD ROM format or on the Internet. The development of programming skills is the least extended of the aims in compulsory education and yet it is included on the curricula of secondary education in more than half the countries. The use of ICTs as tools at the service of educational projects or materials is the most typical mode in virtually all the countries of the European Union, the ICTs constitute subjects of study, but teachers still turn to them as a tool for use with other materials" (MEC-CIDE, 2002:1).

Indeed, "As any educator in 2001 knows, technology is playing a large part in efforts to reform education. But technology itself won't be enough to accomplish the needed changes. A shift in pedagogy must also occur, one that includes the use of best teaching practices and constructivism " (Williams, 2001).

It is clear that in higher education, the universities of the XXI century cannot be understood if we ignore the far-reaching technological, epistemological and pedagogical revolution ushered in with Information and Communication Technologies (ICTs). In fact, according to Aparicio (2000), "the aim of the University today seems to centre on teaching for research and autonomous learning. Within the university, the teacher should above all stimulate the development of a series of values and attitudes among the students (...), and guide the correct building of knowledge, ceding as much of the protagonism as possible in this process to the students. Similarly, the teacher should renounce her traditional role as the main source of knowledge and redefine her role on the basis of the most motivational aspects of teaching methodologies (...) without forgetting, (...), that the purpose of education is none other than that of teaching students to live humanely".

In this regard, Van den Hulst and Cansen (2002) have studied aspects related to the performance and progress of engineering undergraduates. They report that individual differences of personality and time management are important but do not explain all the variance. A significant contribution is made by curriculum organization, in particular the way in which the activities are distributed throughout the degree course, the characteristics of the teaching and the evaluation. According to the authors, "this means that the institutions of higher education can go some way to improving the progress of their students thanks to an efficient organization of the curriculum".

However, the organization of the curriculum can be adapted to some styles of learning, but not to others. Should this prove to be the case, then the requisites will be considerable, since different learning styles require different models of curricular organization.

Severiens, Ten Dam and Van Hout Wolters (2001) published a study that goes some way to clarifying this difficulty. They forward a hypothesis in which it is the learning strategies that form the surface dimension of the learning styles, which in turn are associated with components of the personality that are more stable. If more flexible strategies are used, then it is possible to consider the possibility of a certain modelling of these strategies, which would, at least, solve in part the problem discussed. The study reports that in the case of adult or university students (a) all the students have higher grades in the external than in the internal controls, which means that "*in both educational settings and over the year, the students come to depend more heavily on external sources, such as teachers and the study materials, than on themselves*" (2001:449); (b) towards the end of the academic year, the students tend to used methods of step by step learning or memorization less than at the start of the year: "*they have learnt what is expected of them (perception of task requirements). They rely less on the teacher and on the learning materials and rote learning as a strategy seems to be less important. In short, both studies show a fall in superficial learning. The opposite tendency, an increase in deeper learning, only occurs in tertiary education*" (2001:449-450). However, the study does not demonstrate whether the findings as regards modified learning strategies are stable in time and, therefore, if they might be transferred to future learning experiences.

The subject of the ability to modify learning behaviour can be tackled from two angles: first, idiosyncratic modification, at the level of each individual; second, institutional modification, understood as changes in the set of subjects (averages) as a result of variations in the institutional structures and opportunities. On this point, the Study Group on the Conditions of Excellence in American Higher Education suggests that "the best evidence of excellence in pre-grade education were the learning improvement and student personal development indices. This vision of the development of talent contrasted sharply with the conventional vision of the age which argued that excellence was determined primarily by the institutional resources and reputation" (in Koljatic and Kuh, 2001:351).

Koljatic and Kuh examined more than 73,000 North American students, between 1983 and 1997, and found three basic practices associated with learning: "teacher-student interaction, cooperation between students, and active learning" (2001:352-353). These practices did not vary significantly in the 15-year research period, while statistically significant differences were not found in the type, size and orientation of the higher education institution. This invariance might be explained by demographic changes or the resistance to change within the university governing bodies. In other words, the combination of the three practices is what correlates best with successful learning, but does not necessarily result in the best possible learning.

Based on these characteristics, the framework of variables presented below can perhaps best be understood.

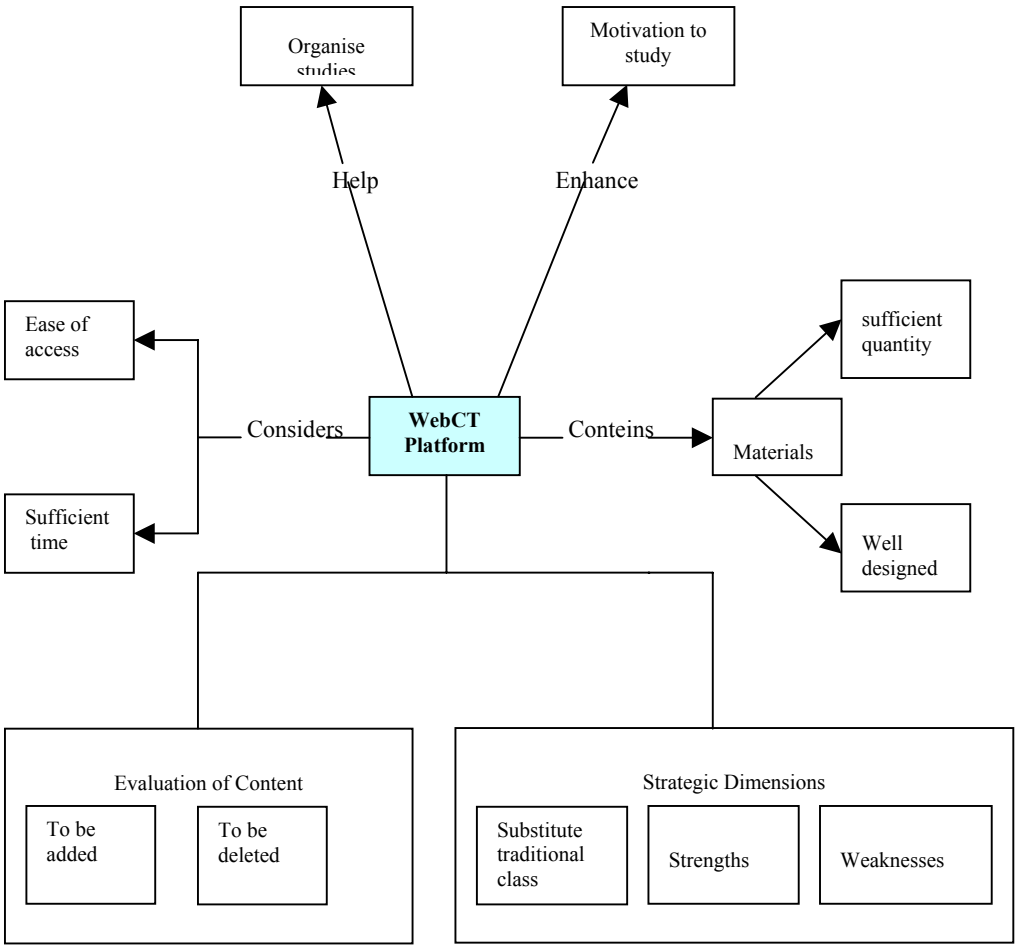

Illustration 1 – Structure of variables

In keeping with these ideas, the School of Medical Technology at the University of Talca has been implementing its courses on WebCT platform, as a means of introducing students to new learning strategies, highlighting the use computers as an essential element in the building of knowledge.

But as in all processes of innovation it is necessary to examine its effectiveness by measuring for ourselves the outcomes of this innovation. Only by doing this can we argue that a particular model of education contributes to an improvement in learning and will we be able to obtain the necessary feedback which in turn will allow improvements to be made.

2. Methodology

This study analyses the responses given by a group of undergraduates enrolled on a course in Medical Technology to a questionnaire examining their **degree of satisfaction concerning the introduction of new technologies as a support to learning.** Here, the specific support was My WebCT platform.

The group was composed of 40 students taking the subject of Clinical Biochemistry, corresponding to the V level of the degree in Medical Technology at the University of Talca. This group used the software program WebCT as a learning support tool.

The questionnaire included a global evaluation and a series of open-ended questions inviting the students to describe the weaknesses of the training program and to offer suggestions as to how it might be improved. Specifically, it assessed the following aspects:

1. Technical and teaching quality of the course materials.
2. Quantity of materials provided on the platform.
3. Accessibility
4. User satisfaction
5. Impact.

The questionnaire was devised by teachers on the undergraduate program of Medical Technology and validated by experts.

3. Results

3.1 Analysis of the survey results:

Item 1

Item 1 states: *"The introduction of the WebCT platform has helped in the organization of my studies"*. The item relates to an important aspect in the literature concerning teaching and learning, namely the organization of the curricular materials. This is particularly important when dealing with students that have been used to a type of teaching characterised essentially by the transmission of knowledge, centred around the figure of the teacher that teaches rather than the student that learns.

As regards Item 1(Table 1)[i] , the modal frequency corresponds to category 3 (40%) which, added to 4 (25%) accounts for almost two thirds of the responses. Thus, according to the majority of students (two thirds) the introduction of the WebCT platform was always or nearly always helpful in the organization of their studies.

Table 1. Item 1 Frequencies

		Frequency	Percentage	Accumulated percentage
Valid responses	1	*2*	*5.0*	*5.0*
	2	*12*	*30.0*	*35.0*
	3	*16*	*40.0*	*75.0*
	4	*10*	*25.0*	*100.0*
	Total	*40*	*100.0*	

Item 2

This item states: *"I felt I had enough time to access the platform"*. Here, the item relates to a second fundamental component for learning: time. The organization of the curriculum requires a temporal distribution, so that the patterns of student exposure to the materials are similar during the periods in which the academic year is divided.

As regards this item (Table 2), a distribution was recorded that was clearly centred around interval 3 (58%) which when added to the frequency of interval 4, amounted to 70% of the replies. The evaluation of availability of time was, therefore, satisfactory, according to the students' responses.

Table 2. Frequencies

		Frequency	Percentage	Accumulated percentage
Valid Responses	1	*1*	*2.5*	*2.5*
	2	*11*	*27.5*	*30.0*
	3	*23*	*57.5*	*87.5*
	4	*5*	*12.5*	*100.0*
	Total	*40*	*100.0*	

Item 3

Item 3 states: *"Access to the platform was straightforward"*. Accessibility to the material is a necessary condition: it is not sufficient for the material to be selected and organized, and appropriately sequenced in time. The support must also be easily accessed by the students. This is not only a technical matter, but physical also: it is concerned with the amount of available equipment, the timetable of use, the facilities provided to the students to access them.

As regards this item (Table 3), the modal frequency was reported at interval 3 (38%), although this was heavily countered by interval 2, which accounted for 35% of the replies. This is compensated, however, by interval 4 which accounts for a further 25%, so that the responses over the mid-point of the scale account for 63% of the replies. Here again a satisfactory response was given to the question regarding ease of access.

Table 3. Item 3 Frequencies

		Frequency	Percentage	Accumulated percentage
Valid responses	1	*1*	*2.5*	*2.5*
	2	*14*	*35.0*	*37.5*
	3	*15*	*37.5*	*75.0*
	4	*10*	*25.0*	*100.0*
	Total	*40*	*100.0*	

Item 4

This item states: *"I feel that the introduction of these methods has increased my motivation for studying this subject"*. Motivation is a highly unstable concept across studies in pedagogic theory. However, the usual sense given to the term (which is that adopted by the students) is related to the degree of user friendliness shown by the platform: a user friendly platform facilitates the work, requiring less additional effort which might otherwise not be conducive to the aims of the work, while providing good feedback. It is to be hoped that well-organised and sequenced material, carefully ordered over time, and accessible to all, at all times, might be considered "motivating" for the students.

The data show a high degree of agreement with the fact that the methods have increased motivation for study (Table 4). 43% stated that this had been the case "nearly always" and 20% stated that "always".

Table 4. Item 4 frequencies.

		Frequency	Percentage	Accumulated percentage
Valid responses	1	*2*	*5.0*	*5.0*
	2	*13*	*32.5*	*37.5*
	3	*17*	*42.5*	*80.0*
	4	*8*	*20.0*	*100.0*
	Total	*40*	*100.0*	

Item 5.

Item 5 states: *"I consider that the materials prepared were well designed*". The design of materials is key to the preparation of web materials. Unlike traditional text books in which the material is presented in a linear fashion, with illustrations and diagrams supporting the text, in learning programs non-textual materials can be included: iconic, kinesic, audio, all of which cannot be incorporated in a printed text.

The responses to this item (Table 5) are quite clear: 93% of those interviewed declared that the material had been nearly always (73%) or always (20%) well designed.

The degree of satisfaction in the design component was very high, which might be interpreted as a global appreciation of the platform that is independent of the other factors (organization, sequencing, time, accessibility).

Table 5. Item 5 Frequencies.

		Frequency	Percentage	Accumulated percentage
Valid responses	2	*3*	*7.5*	*7.5*
	3	*29*	*72.5*	*80.0*
	4	*8*	*20.0*	*100.0*
	Total	*40*	*100.0*	

Item 6.

The text states*: "I consider the materials sufficient for reinforcing the learning taking place in the classroom and the laboratories"*. The text points to two key issues. The first relates to the degree of satisfaction as to whether the material was or was not sufficient to meet the study needs. The second - less obvious to the reader of the item - is related to the role assigned to the program: to act as support material for work undertaken in the classroom and the laboratories. In other words, the program only has a subsidiary role in the eyes of the teachers that designed the tool, i.e. a back-up to the teaching being undertaken in the classes and laboratories.

The replies were positive (Table 6) with 53% stating that the material had been sufficient for reinforcing learning nearly always, while 25% stated that it had always been so. The accumulated percentage of these two responses amounts to 78%.

Table 6. Item 6 Frequencies.

		Frequency	Percentage	Accumulated percentage
Valid responses	1	*1*	*2.5*	*2.5*
	2	*8*	*20.0*	*22.5*
	3	*21*	*52.5*	*75.0*
	4	*10*	*25.0*	*100.0*
	Total	*40*	*100.0*	

3.2 Analysis of open-ended responses.

Below we examine the open-ended responses given by the students. An attempt has been made wherever possible to classify them in accordance with the emerging nature of the response.

Item 7. Text: *"In your opinion, what additional material should be included in this platform".*

The responses can be grouped in four basic categories (Only individual replies were maintained, eliminating any repetitions thereafter). Thus rather than a statistical vision, what we have is a more substantive picture of requirements.

Subject contents: basic aspects of each subject, wider reading matter, clinical cases for study, and requests for specific subject matters.

Resources for working with the program: they requested greater graphic support (diagrams, photographs), links via Internet to documentation centres and specialist journals, questions, surveys and test points; laboratory material.

Administrative features: Grades, important information, as well as a specific request for more terminals and printers.

Unclassified responses: which in general stated that they required nothing else, expressing satisfaction with what was available.

Item 8. Text: *What material would you remove from this platform?*

The questions sought to discover which materials the students felt were unnecessary or redundant. The replies could be grouped in two basic categories:
Contents: Most replies said they would change none of the features, which would seem to contradict the previous responses in item 7 which asked about possible additions.
Resources of support: Material with many megabytes (drawings and statistical graphs) owing to the slowness of the network or the impossibility of saving the material on diskettes of 1.4 MB. A reference was also made to the fact that both the chat room and the e-mail were unnecessary. The former is understandable given that the students see each other every day, and therefore do not need to communicate with each other via a computer interface. The case of e-mail is perhaps different and its failure to be useful might be due to the fact that it was not used. It is worth examining the potential of electronic mail for supporting student learning.

Item 9. Text: *In your opinion, with the materials available on the platform, is attendance at theoretical classes necessary?*

The question in item 9 stresses a key point of teaching supported by computer and constitutes one of the main lines of discussion on this matter, in other words, the capacity that a platform such as WebCT has to substitute classroom teaching completely. The students' responses are summarised in Table 7.

Table 7. Item 9 Frequencies.

Categories		n	Percentage	Accumulated Percentage
Valid responses	On occasions	*1*	*2.6*	*2.6*
	Not a substitute	*14*	*35.9*	*38.5*
	Not a substitute (plus reasoning)	*24*	*61.5*	*100.0*
	Total	39	*100.0*	

Given the small degree of variation in the replies, a quantitative analysis was undertaken. The responses could be divided in just three groups (see Table 7 and their corresponding percentages). The justifications given by the students concerned the irreplaceable nature of the class, as the latter enabled the teacher to provide explanations that went beyond those offered by the platform. The latter is seen as an aid to learning, and not as the principal source; a role maintained by the traditional class.

Item 10. Text: *Name three weaknesses in the system.*

Students were asked to identify weaknesses in the support system on the platform. The replies are presented in Table 8.
The first group are the weaknesses attributable to the system itself, that is, the installations and accessibility, as well as the resources available.
These are followed by two weaknesses attributable to the design: first, the fact that the amount of materials was at times excessive; and second, the difficulties encountered in downloading the materials onto personal computers.

As regards administrative weaknesses, we found references to the fact that the system is not available in all subjects, the materials are sometimes not in the right place and an excess of material.
Finally, a crucial observation related to the impersonal nature of the relationship or interaction of the student with the machine. This is congruent with the appreciation expressed by the students for traditional classes (see previous item).

Table 8. Item 10	
Categories	Description
Attributable to the system	Lack of security. Slow, delays in opening the system. Difficult of access; few computers. Availability of sheets and computers for downloading materials. Availability outside UTAL
Attributable to the design	The material is at times disordered The illustrations are fuzzy The information on slides is difficult to download, information boring Difficulties in downloading photographs. Difficulties form transferring from Power Point to Word
Administrative	Material contents were not always available on time. Not available for all subjects. A lot of information.
Relations	Greater degree of impersonality.

Item 11. Text: *Name three strengths in the system*

Item 11 asked students to identify strengths. Many were identified, but they can be readily classified into the following groups: administrative aspects, support, characteristics, functionality and other features (Table 9).

As regards administrative aspects of the platform, the students stressed its accessibility. This is a particular strength given that the student can then organize his or her time, granting them a certain degree of independence.

As for the support features of the platform, we found that the students appreciated the possibility of accessing the class material in slide form, thereby complementing the classes. Students were able to clarify their understanding and as such the platform was a great support to their study. Moreover, working with the platform was considered comfortable, with good availability of materials, strengthening learning, which facilitated the study process, and allowed students to organise their time more efficiently.

Third, among the most appreciated features were the clarity of the information and the ease of understanding. Similarly, it was felt that the program was more interactive. The functionality of the system meant that materials were readily found, complementing well the theoretical classes, providing the points for study and a clear order for organizing the materials.

Finally, the students added certain strengths that went beyond the scope of the questionnaire, noting that this resource helped raise the level of this degree course, and the improvement of the teachers in accordance with the advances in technology. This gives a note of modernity and universality to their training.

Table 9. Item 11	
Categories	Description
Administrative features	Accessibility: immediate, opportune, access to materials, from anywhere. Independence. Questions can be raised with teachers from a different platform Ease of use: more convenient than going to the library; available at all times. Speed
Support features	Access class materials in slide format, complementing the classes, clarification of understanding; Support for private study; cheaper than photocopies, Good information, well presented materials; Ease of study and easy access to materials; Materials available are time saving and allow you to make the most of one's time; Ensure good organization, Exercises. Private notification of grades.
Characteristics	Clear, informative, interactive: interaction with teachers and peers
Functionality	Help in finding materials, Complements theoretical classes Gives study outlines, Order in which to organize materials
Other features	Improves the overall level of the degree. Improvement of teachers in accordance with the advances in technology. Modernity, Universality

4. Conclusions

Our analysis allows us to draw a number of major conclusions, some referring to what was in fact observed, and others which point to ways in which the teaching services might be improved.

The first point to make is the high degree of satisfaction expressed by the students regarding the use made by the School of the MyWebCT platform to support certain courses within their degree.

The benefits to the students were reported in the organization of their studies (Item 1), that is, that the structured nature of the materials was considered of importance. Similarly they reported having sufficient time to access the platform (Item 2). Yet, if it is borne in mind that the typical complaint of students is the shortage of time to study, the response to item 2 might be understood as an effect of the organisation of the material. Research undertaken into distance learning in the United States has shown that students prefer and also obtain better

results when the materials are well ordered and structured. The recognition of these above factors has had a direct impact on improvement in the levels of motivation (Item 4) of the students for study.
A further aspect worth highlighting is the positive appraisal given to the design quality of the material (Item 5), although certain opinions were expressed concerning problems in downloading the materials given their density.
The assessment of the role of the platform materials in supporting the learning process was positive (Item 6), although in no circumstances would the students accept or support an initiative to substitute the traditional class with a totally asynchronous method such as that provided by the platform (Item 9).
Opinions were expressed regarding what should be added, deleted and modified. These need to be taken into consideration in optimising work with the platform.

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[i] The scale values are as follows: 1.- Never; 2.- Occasionally; 3.- Nearly always; 4.- Always